

WHITEPAPER: ROBOTC DISPENSING BENEFITS CASE

Robotic dispensing is a process that uses robots to automate the tasks of dispensing medication, searching for medication, and managing stock levels in pharmacies.

1. Improved Accuracy and Precision

- **Reduced errors:** Robots minimise human errors, ensuring precise measurements and dispensing.
- **Consistency:** They maintain uniformity, especially important in pharmaceuticals or chemical compounding.

EVIDENCE:

Batson S, Herranz A, Rohrbach N, Canobbio M, Mitchell SA, Bonnabry P. Automation of in-hospital pharmacy dispensing: a systematic review. *Eur J Hosp Pharm.* 2021 Mar;28(2):58-64. doi: 10.1136/ejhpharm-2019-002081. Epub 2020 Apr 21. PMID: 32434785; PMCID: PMC7907692.

Ahtiainen HK, Kallio MM, Airaksinen M, Holmström AR. Safety, time and cost evaluation of automated and semi-automated drug distribution systems in hospitals: a systematic review. *Eur J Hosp Pharm.* 2020 Sep;27(5):253-262. doi: 10.1136/ejhpharm-2018-001791. Epub 2019 Mar 19. PMID: 32839256; PMCID: PMC7447254.

Takase T, Masumoto N, Shibatani N, Matsuoka Y, Tanaka F, Hirabatake M, Kashiwagi H, Nishioka I, Ikesue H, Hashida T, Koide N, Muroi N. Evaluating the safety and efficiency of robotic dispensing systems. *J Pharm Health Care Sci.* 2022 Oct 1;8(1):24. doi: 10.1186/s40780-022-00255-w. PMID: 36180937; PMCID: PMC9526262.

Rodriguez-Gonzalez CG, Herranz-Alonso A, Escudero-Vilaplana V, Ais-Larisgoitia MA, Iglesias-Peinado I, Sanjurjo-Saez M. Robotic dispensing improves patient safety, inventory management, and staff satisfaction in an outpatient hospital pharmacy. *J Eval Clin Pract.* 2019 Feb;25(1):28-35. doi: 10.1111/jep.13014. Epub 2018 Aug 22. PMID: 30136339.

2. Enhanced Efficiency and Speed

- **Faster processing:** Robots can dispense items more quickly than manual methods, increasing productivity.
- **24/7 operation:** Automation can run continuously, reducing downtime and increasing output.

EVIDENCE:

Batson S, Herranz A, Rohrbach N, Canobbio M, Mitchell SA, Bonnabry P. Automation of in-hospital pharmacy dispensing: a systematic review. *Eur J Hosp Pharm.* 2021 Mar;28(2):58-64. doi: 10.1136/ejhpharm-2019-002081. Epub 2020 Apr 21. PMID: 32434785; PMCID: PMC7907692.

Ahtiainen HK, Kallio MM, Airaksinen M, Holmström AR. Safety, time and cost evaluation of automated and semi-automated drug distribution systems in hospitals: a systematic review. *Eur J*

Hosp Pharm. 2020 Sep;27(5):253-262. doi: 10.1136/ejhpharm-2018-001791. Epub 2019 Mar 19. PMID: 32839256; PMCID: PMC7447254.

Basile K, Martínez M, Lucaci JD, Goldblatt C, Beer I. Enhancing Operational Efficiency and Service Delivery through a Robotic Dispensing System: A Case Study from a Retail Pharmacy in Brazil. Pharmacy (Basel). 2024 Aug 23;12(5):130. doi: 10.3390/pharmacy12050130. PMID: 39311121; PMCID: PMC11417772.

Alahmari AR, Alrabghi KK, Dighriri IM. An Overview of the Current State and Perspectives of Pharmacy Robot and Medication Dispensing Technology. Cureus. 2022 Aug 31;14(8):e28642. doi: 10.7759/cureus.28642. PMID: 36196333; PMCID: PMC9525046.

Berdot S, Korb-Savoldelli V, Jaccoulet E, Zaugg V, Prognon P, Lê LMM, Sabatier B. A centralized automated-dispensing system in a French teaching hospital: return on investment and quality improvement. Int J Qual Health Care. 2019 Apr 1;31(3):219-224. doi: 10.1093/intqhc/mzy152. PMID: 30007301.

3. Cost Savings

- Reduced labour costs: Automating dispensing tasks decreases the need for manual labour.
- Minimised waste: Precise dispensing reduces product loss and waste.

EVIDENCE:

Batson S, Herranz A, Rohrbach N, Canobbio M, Mitchell SA, Bonnabry P. Automation of in-hospital pharmacy dispensing: a systematic review. Eur J Hosp Pharm. 2021 Mar;28(2):58-64. doi: 10.1136/ejhpharm-2019-002081. Epub 2020 Apr 21. PMID: 32434785; PMCID: PMC7907692.

Ahtiainen HK, Kallio MM, Airaksinen M, Holmström AR. Safety, time and cost evaluation of automated and semi-automated drug distribution systems in hospitals: a systematic review. Eur J Hosp Pharm. 2020 Sep;27(5):253-262. doi: 10.1136/ejhpharm-2018-001791. Epub 2019 Mar 19. PMID: 32839256; PMCID: PMC7447254.

4. Improved Safety

- Reduced exposure: Robots handle hazardous materials, protecting humans from potential risks (e.g., cytotoxic pharmacotherapy).
- Medication safety: In pharmacies, robotic dispensing ensures the right patient receives the correct dosage.

EVIDENCE:

Batson S, Herranz A, Rohrbach N, Canobbio M, Mitchell SA, Bonnabry P. Automation of in-hospital pharmacy dispensing: a systematic review. Eur J Hosp Pharm. 2021 Mar;28(2):58-64. doi: 10.1136/ejhpharm-2019-002081. Epub 2020 Apr 21. PMID: 32434785; PMCID: PMC7907692.

Ahtiainen HK, Kallio MM, Airaksinen M, Holmström AR. Safety, time and cost evaluation of automated and semi-automated drug distribution systems in hospitals: a systematic review. Eur J Hosp Pharm. 2020 Sep;27(5):253-262. doi: 10.1136/ejhpharm-2018-001791. Epub 2019 Mar 19. PMID: 32839256; PMCID: PMC7447254.

Takase T, Masumoto N, Shibatani N, Matsuoka Y, Tanaka F, Hirabatake M, Kashiwagi H, Nishioka I, Ikesue H, Hashida T, Koide N, Muroi N. Evaluating the safety and efficiency of robotic dispensing systems. *J Pharm Health Care Sci*. 2022 Oct 1;8(1):24. doi: 10.1186/s40780-022-00255-w. PMID: 36180937; PMCID: PMC9526262.

Rodriguez-Gonzalez CG, Herranz-Alonso A, Escudero-Vilaplana V, Ais-Larigoitia MA, Iglesias-Peinado I, Sanjurjo-Saez M. Robotic dispensing improves patient safety, inventory management, and staff satisfaction in an outpatient hospital pharmacy. *J Eval Clin Pract*. 2019 Feb;25(1):28-35. doi: 10.1111/jep.13014. Epub 2018 Aug 22. PMID: 30136339.

Al Nemari M, Waterson J. The Introduction of Robotics to an Outpatient Dispensing and Medication Management Process in Saudi Arabia: Retrospective Review of a Pharmacy-led Multidisciplinary Six Sigma Performance Improvement Project. *JMIR Hum Factors*. 2022 Oct 11;9(4):e37905. doi: 10.2196/37905. PMID: 36222805; PMCID: PMC9597422.

Berdot S, Korb-Savoldelli V, Jaccoulet E, Zaugg V, Prognon P, Lê LMM, Sabatier B. A centralized automated-dispensing system in a French teaching hospital: return on investment and quality improvement. *Int J Qual Health Care*. 2019 Apr 1;31(3):219-224. doi: 10.1093/intqhc/mzy152. PMID: 30007301.

5. Enhanced Inventory Management

- Real-time tracking: Systems can monitor stock levels and update inventories automatically.
- Reduced stockouts: Accurate data helps in predicting supply needs more efficiently.

EVIDENCE:

Rodriguez-Gonzalez CG, Herranz-Alonso A, Escudero-Vilaplana V, Ais-Larigoitia MA, Iglesias-Peinado I, Sanjurjo-Saez M. Robotic dispensing improves patient safety, inventory management, and staff satisfaction in an outpatient hospital pharmacy. *J Eval Clin Pract*. 2019 Feb;25(1):28-35. doi: 10.1111/jep.13014. Epub 2018 Aug 22. PMID: 30136339.

Al Nemari M, Waterson J. The Introduction of Robotics to an Outpatient Dispensing and Medication Management Process in Saudi Arabia: Retrospective Review of a Pharmacy-led Multidisciplinary Six Sigma Performance Improvement Project. *JMIR Hum Factors*. 2022 Oct 11;9(4):e37905. doi: 10.2196/37905. PMID: 36222805; PMCID: PMC9597422.

6. Better Compliance and Documentation

- Traceability: Robotic systems record each transaction, aiding compliance with regulatory standards.
- Audit support: Detailed logs facilitate easier audits and quality checks.

EVIDENCE:

7. Space Optimization

- Compact designs: Robots can operate in smaller areas compared to traditional setups, saving floor space.
- Efficient layouts: Customisable configurations maximise storage and workflow efficiency.

EVIDENCE:

Ruhle F, Braun R, Ostermann H. Impact of robotic dispensing machines in german pharmacies on business performance indicators. *Libyan J Med*. 2009 Dec 1;4(4):146-51. doi: 10.4176/090731. PMID: 21483538; PMCID: PMC3066739.

8. Improved Customer Experience

- Reduced wait times: Faster, accurate dispensing leads to shorter queues and better service, especially in pharmacies.
- Reliability: Customers benefit from consistent and reliable product quality.

EVIDENCE:

Ahtiainen HK, Kallio MM, Airaksinen M, Holmström AR. Safety, time and cost evaluation of automated and semi-automated drug distribution systems in hospitals: a systematic review. *Eur J Hosp Pharm*. 2020 Sep;27(5):253-262. doi: 10.1136/ejhpharm-2018-001791. Epub 2019 Mar 19. PMID: 32839256; PMCID: PMC7447254.

Momattin H, Arafa S, Momattin S, Rahal R, Waterson J. Robotic Pharmacy Implementation and Outcomes in Saudi Arabia: A 21-Month Usability Study. *JMIR Hum Factors*. 2021 Sep 1;8(3):e28381. doi: 10.2196/28381. PMID: 34304149; PMCID: PMC8444036.

Alam S, Osama M, Iqbal F, Sawar I. Reducing pharmacy patient waiting time. *Int J Health Care Qual Assur*. 2018 Aug 13;31(7):834-844. doi: 10.1108/IJHCQA-08-2017-0144. PMID: 30354876.

9. Enhanced Focus on Complex Tasks

- Staff redeployment: Automation frees up human staff to focus on more complex or patient-centred tasks rather than repetitive work.

EVIDENCE:

Rodriguez-Gonzalez CG, Herranz-Alonso A, Escudero-Vilaplana V, Ais-Larisgoitia MA, Iglesias-Peinado I, Sanjurjo-Saez M. Robotic dispensing improves patient safety, inventory management, and staff satisfaction in an outpatient hospital pharmacy. *J Eval Clin Pract*. 2019 Feb;25(1):28-35. doi: 10.1111/jep.13014. Epub 2018 Aug 22. PMID: 30136339.

Lin AC, Gamble JM, Gabriel MK, Hong TY. Evaluating the impact of an automated drug retrieval cabinet and robotic dispensing system in a large hospital central pharmacy. *Am J Health Syst Pharm*. 2024 Sep 27;zxae225. doi: 10.1093/ajhp/zxae225. Epub ahead of print. PMID: 39330997.

Berdot S, Korb-Savoldelli V, Jaccoulet E, Zaugg V, Prognon P, Lê LMM, Sabatier B. A centralized automated-dispensing system in a French teaching hospital: return on investment and quality

improvement. Int J Qual Health Care. 2019 Apr 1;31(3):219-224. doi: 10.1093/intqhc/mzy152. PMID: 30007301.

By integrating robotic dispensing, industries can enhance operational performance, reduce risks, and provide a higher standard of service or product delivery.